WHAT IS CLAIMED IS:

1. A method of forming an amorphous silicon-based film on a substrate located inside a deposition chamber, comprising:

introducing a silicon-based volatile into the deposition chamber;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film.

2. The method of claim 1, wherein the conductivity-increasing volatile and the conductivity-decreasing volatile are introduced into the deposition chamber at respective relative flow rates selected to achieve a desired film resistivity.

3. The method of claim 2, wherein the relative flow rates are selected to achieve a film resistivity of about 10^3-10^7 ohm-cm.

4. The method of claim 1, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of ammonia, the phosphine and the ammonia being introduced into the deposition chamber at a flow rate ratio in a range of about 1:1000 to about 1:10 (phosphine:ammonia).

5. The method of claim 1, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of methane, the phosphine and the methane being introduced into the deposition chamber at a flow rate ratio in a range of about 1:100 to about 1:1 (phosphine:methane).

6. The method of claim 1, wherein the conductivity-increasing volatile includes a dopant.

7. The method of claim 6, wherein the dopant includes an n-type dopant.

8. The method of claim 7, wherein the n-type dopant includes phosphorous.

9. The method of claim 6, wherein the dopant includes a p-type dopant.

10. The method of claim 9, wherein the p-type dopant includes boron.

11. The method of claim 1, wherein the amorphous silicon-based film is characterized by a band gap, and the conductivity-decreasing volatile includes a band gap increasing component that increases the band gap of the amorphous silicon-based film relative to a film formed under similar conditions but without the band gap increasing component.

12. The method of claim 1, wherein the conductivity-decreasing volatile includes nitrogen.

13. The method of claim 12, wherein the conductivity-decreasing volatile includes ammonia.

14. The method of claim 1, wherein the conductivity-decreasing volatile includes N_2O.

15. The method of claim 1, wherein the conductivity-decreasing volatile includes carbon.

16. The method of claim 15, wherein the conductivity-decreasing volatile includes methane.

17. The method of claim 1, wherein the silicon-based film consists of silane, the conductivity-increasing volatile consists of phosphine, and the

conductivity-decreasing volatile consists of ammonia.

18. The method of claim 1, wherein the silicon-based film consists of silane, the conductivity-increasing volatile consists of phosphine, and the conductivity-decreasing volatile consists of methane.

19. The method of claim 1, further comprising introducing into the deposition chamber a second conductivity-decreasing volatile.

20. The method of claim 19, wherein the silicon-based film consists of silane, the conductivity-increasing volatile consists of phosphine, the first conductivity-decreasing volatile consists of ammonia, and the second conductivity-decreasing volatile consists of methane.

21. A field emission display device having a substrate fabricated according to claim 1.

22. An electronic device having a substrate fabricated according to claim 1.

23. A flat panel display device having a substrate fabricated according to claim 1.

24. A method of forming an amorphous silicon-based film on a substrate located inside a deposition chamber, comprising:

introducing a silicon-based volatile into the deposition chamber;

introducing phosphine into the deposition chamber; and

introducing a nitrogen-containing volatile into the deposition chamber.

25. A field emission display device having a substrate fabricated according to claim 24.

26. An electronic device having a substrate fabricated according to claim 24.

27. A flat panel display device having a substrate fabricated according to claim 24.

28. A method of forming an amorphous silicon-based film on a substrate located inside a deposition chamber comprising:

introducing a silicon-based volatile into the deposition chamber;

introducing phosphine into the deposition chamber; and

introducing a carbon-containing volatile into the deposition chamber.

29. A field emission display device having a substrate fabricated according to claim 28.

30. An electronic device having a substrate fabricated according to claim 28.

31. A flat panel display device having a substrate fabricated according to claim 28.

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